CONTAINER

Technical Field

This invention relates to containers, primarily, but not exclusively, for retail marketing of foodstuffs and to methods of manufacturing such containers.

Background to the Invention

Conventional foodstuffs containers for retail use consist of a bowl portion thermoformed from a sheet of clear thermoplastic synthetic resin material, together with a lid thermoformed from the same material. The lid and the bowl have peripheral configurations such that the lid can be readily snap-fitted on to, and readily released by a user, from the bowl.

From the point of view of the supplier ease of snap fitting the lid onto the bowl is of importance as it reduces the time and effort needed to fill and close a container. However, the ease of removal of the lid is problematic for the retailer since removal, and replacement of the lid by someone tampering with the container in-store leaves no evidence of such tampering. In order to provide evidence of tampering it is usual to secure the lid to the bowl by means of self adhesive labels that engage both the lid and the bowl, and which must be torn or otherwise damaged in order to remove the lid from the bowl. Thus damage to a label is clear evidence of tampering when the container is displayed for sale.

However, the use of self adhesive labels for tamper evident securing of the lid to the container is disadvantageous both in the cost of producing the labels, and in the cost of applying the labels to the closed container.

Furthermore, it is not unusual for edge portions
labels to become displaced, and then to adhere
stack of containers perhaps resulting in damage to a label when containers are separated.

Accordingly, it is an object of the present invention to provide a "tamper-evident" container in which the aforementioned disadvantages are minimised or obviated and to provide an efficient method of manufacturing such containers.

Disclosure of the Invention

In accordance with a first aspect of the present invention there is provided a container comprising a bowl, and a lid for closing the bowl, the periphery of the bowl and the lid being arranged to be non-releasably interconnected, and, said lid or said bowl having a frangible boundary region adjacent to its periphery, whereby at least a major portion of the lid can be detached from the periphery of the container to open the container. Preferably said frangible boundary region is provided on said lid whereby a major portion of the lid can be detached from the periphery of the lid to open the container leaving the periphery of the lid attached to the periphery of the bowl.

Preferably the periphery of the bowl and the lid are arranged to co-operate in such a manner that the lid can be engaged as a non-release snap-fit with the bowl.

Preferably the lid is shaped, inwardly of said frangible boundary region, to engage the inner surface of the bowl to define a peripheral seal between the lid and the bowl.

Desirably the lid is shaped, inwardly of said fra
engage as a snap-fit or push-fit within the bowl
peripheral interface of the bowl and the lid.

Preferably said frangible boundary region is disposed on a raised periphery of the lid between said inner sealing region and a peripheral wall of the lid, which encompasses the periphery of the bowl.

Preferably said frangible boundary region extends completely around the lid so that a centre, main, portion of the lid can be removed by fracturing the boundary region, leaving the periphery of the lid in place on the bowl.

Alternatively said frangible boundary region extends around substantially the whole of, but not the entire, periphery of the lid so as to leave a non-frangible region which acts as a retaining tab holding the centre, main portion of the lid to the periphery of the lid when the lid has been opened along the frangible boundary region.

Conveniently the frangibility of said boundary region is provided by perforating the boundary region.

Where the material chosen for the lid is a material which can relatively easily be torn, for example High Impact Polystyrene (HIPS) or Oriented Polystyrene (OPS), then the frangibility is provided by a plurality of perforations aligned along the boundary, and extending completely through the material thickness, the perforations being spaced apart by regions of the lid of full material thickness.

Alternatively, where the material chosen for th
difficult to tear, for example Amorphous Polye
then the frangibility of the said boundary region is provided by reducing the thickness of the lid material throughout the boundary region, and perforating the reduced thickness so that the boundary region is defined by a plurality of perforations completely through the material, along the line of said boundary region, spaced apart by regions of the lid of reduced thickness.

In accordance with a second aspect of the present invention there is provided a method of producing a frangible boundary region in a container lid, comprising supporting that region of the lid which is to contain the frangible boundary, on an anvil the surface of which has a plurality of spaced recesses, and cutting said material by means of a blade having a planar edge parallel to the plane of the top surface of said anvil so that the blade cuts through the lid material completely where the lid material is supported on the anvil, and the material of the lid aligned with said recesses is flexed into said recesses by the blade, the depth of said recesses below the top surface of the anvil being less than the thickness of the lid material so that the lid material above said recesses is cut into and so thinned, but is not cut completely through, by said blade.

Preferably said blade has a stop member associated therewith, the stop member having a lower face parallel to the upper face of the anvil, and spaced from the cutting edge of the blade by the thickness of the lid material to be cut, said stop member engaging the upper surface of the lid material during cutting so that penetration of the blade through the material is limited to the thickness of the material so that there is substantially no impact of the cutting edge of the blade on the top face of the anvil.

In a further aspect the invention resides in an ap
manufacture of a container having a frangible bc

Brief Description of the Drawings

One example of the invention is illustrated in the accompanying drawings wherein,

Figure 1 is a diagrammatic perspective view of a food container;

Figure 2 is similar to Figure 1 illustrating the manner in which the container is opened;

Figure 3 is a view similar to Figure 1 showing the container fully opened;

Figure 4 is a diagrammatic cross-sectional view of the container of Figure 1 illustrating the lid immediately prior to its engagement with the bowl of the container;

Figure 5 is an enlargement of part of Figure 4;

Figure 6 is a view similar to Figure 5 but illustrating the peripheral cross-section of the bowl and lid at a different point around the periphery of the container;

Figures 7, 8 and 9 are views similar to Figures 4, 5 and 6 respectively but illustrating the lid in place on the bowl;

Figure 10 is a diagrammatic perspective
frangible boundary region of the lid;

Figure 11 is a sectional view along the line B – B of Figure 10;

Figure 12 is a view similar to Figure 10 of an alternative frangible boundary region;

Figure 13 is a sectional view along the line A – A in Figure 12;

Figure 14 is a diagrammatic perspective view of the formation of a frangible boundary region of the kind shown in Figure 12;

Figure 15 is a diagrammatic cross-sectional view illustrating a later stage in the operation of the apparatus of Figure 14, and;

Figure 16 is a diagrammatic perspective view of a modification of the blade of Figures 14 and 15.

Preferred Modes of Carrying Out the Invention

Referring to the drawings it will be recognised while an oval container is depicted herein for convenience, the shape of the container is not of particular relevance to the present invention and a wide variety of different container shapes can make use of the invention.

The container is intended for containing foodstuffs for retail sales. The use of thermoformed plastics containers for foodstuffs sold through supermarkets and the like is well known. Conventional containers consist of a bowl and a

lid, and usually the lid is engaged as a releasabl
can be removed from the bowl without damagin
Conventionally self adhesive labels are utilised to secure the lid to the bowl in a manner which provides evidence of tampering if an attempt is made to remove the lid from the bowl.

As is apparent form the drawings, in a preferred embodiment of the present invention the container again comprises a thermoformed bowl 11 and a thermoformed lid 12. The term "thermoforming" is well known in the art, and denotes a moulding process in which a sheet of thermoplastic synthetic resin material is heated, and is then pressed against a mould tool either by reducing the atmospheric pressure between the thermoplastic sheet and the mould tool (vacuum forming) or by increasing the atmospheric pressure at the face of the sheet remote from the mould tool (pressure forming). The heated, thermoplastic sheet is caused to conform to the shape of the mould tool and is allowed to cool to the point at which it sets, before being removed from the mould tool.

In the present application the preferred material for formation of the bowl and the lid is APET, but it will be recognised that other materials are possible, for example Polypropylene (PP), Polyvinylchloride (PVC), High Impact Polystyrene (HIPS) and Oriented Polystyrene (OPS).

It can be seen from Figures 4, 5 and 6 that the upper, free edge of the bowl 11 has an outwardly extending region 13 followed by an inwardly inclined wall 14. The upper edge of the wall 14 is inclined outwardly at 15, and then defines a peripheral outwardly extending flange 16 which is then turned at right angles and defines an outer, downwardly extending peripheral wall 17

terminating in an outwardly extending lip 18. A
angularly spaced points around the periphery of
defined between the flange 16 and the wall 17 (apparent in Figure 6) is replaced by an inclined shoulder 19 (shown in Figure 5).

The lid 12 includes a planar central region 21 shaped at its outer edge to define a circumferential, upwardly extending, inwardly inclined wall 22. The angle of inclination of the wall 22 is substantially equal to the angle of inclination of the wall 14 of the bowl 11. At its upper-most edge the wall 22 is turned outwardly to define a peripheral flange 23 parallel to, but spaced from the main portion 21 of the lid. At its outermost edge the flange 23 is turned downwardly to define a downwardly extending peripheral wall 24 terminating in an outwardly turned lip 25.

At a plurality of equi-angularly spaced regions around the peripheral wall 24, aligned with the shoulders 19 of the bowl 11, the wall 24 is indented as shown in Figure 5 to produce a flange 26 extending inwardly parallel to the flange 23 and an inclined ramp surface 27.

Ignoring for a moment the provision of the inward formations 26, 27 on the lid 12, it will be recognised that engagement of the lid 12 with the bowl 11 (as shown in Figures 7, 8 and 9) results in engagement of the outer face of the wall 22 of the lid with the inner face of the wall 14 of the bowl, the lower surface of the planar central portion 21 of the lid seating, at its periphery, on the shoulder 13 of the bowl. The flange 16 and wall 17 of the bowl are received between the wall 22 and the wall 24 of the lid, the flange 23 of the lid being positioned in close proximity and parallel to the flange 16 of the bowl. This arrangement is illustrated in Figure 9, it being understood that

slight flexure of the lid and the bowl takes plac
lid 12 rides on the inclined shoulder 15 of the b
connection of the lid in the bowl occurs. Furthermore, the fit of the wall 22 within the wall 14 is such that a peripheral seal is produced at this interface of the lid and bowl.

It will be recognised however that as the lid is being engaged with the bowl then the initial point of contact of the lid and bowl will be contact between the inclined ramp surface 27 of the inward formations of the lid and the inclined shoulders 19 of the bowl, provided of course that during engagement of the lid with the bowl the rotational orientation of the lid in relation to the bowl is such that the ramp surfaces 27 are circumferentially aligned with the inclined shoulders 19. Pressing the lid 12 downwardly to its closed position on the bowl causes the ramp surfaces 27 to slide on the shoulders 19 flexing the peripheral region of the lid outwardly and/or the peripheral region of the bowl inwardly. However, as the junction of each ramp surface 27 with its associated shoulder 26 passes the free edge of the lip 18 of the bowl the parts can restore to their original configurations by virtue of their own inherent resilience, so that the shoulders 26 snap-fit beneath the lip 18 of the bowl.

It will be recognised therefore that the lid is engaged as a snap-fit with its respective bowl both by virtue of the snap inter-engagement of the walls 22 and 14, and by virtue of the snap inter-engagement of the shoulders 26 beneath the lip 18. However, whereas the snap engagement of the wall 22 with the wall 14 is a relatively light engagement, the engagement of the shoulders 26 beneath the lip 18 is a substantially permanent engagement (a non-release snap-fit) since pulling the lid upwardly away from the bowl will not induce flexure of the periphery of the lid outwardly or the periphery of

the bowl inwardly, the surfaces of the shoulders
right angles to the line of action if an attempt is
bowl. In practice therefore once the lid has been snap engaged with the bowl and the shoulders 26 have engaged beneath the lip 18 the periphery of the lid cannot be disengaged from the periphery of the bowl without damaging and the lid and/or the bowl, and leaving visible signs of such damage.

It will be recognised that in the container described so far the lid can readily be engaged as a snap-fit with the bowl, and this can be accomplished using conventional container assembling machinery after the appropriate content has been introduced into the bowl. However, for all practical purposes the lid cannot be removed from the bowl once it has been snapped into engagement therewith. Thus in order to provide the end user with access to the interior of the container the lid is provided with a frangible boundary region 31 shown as a broken line in Figures 1, 2 and 3. As is apparent form the drawings, preferably the frangible boundary region coincides with the mid-line of the flange 23 of the lid, and in order to open the container the central region of the lid, that is to say the region inwardly of the line of the boundary region 31, is lifted upwardly so that the material of the lid tears along the boundary region 31. To facilitate lifting the central region of the lid, adjacent one part of the periphery thereof, to start the tear along the boundary region 31, the lid is moulded with gripping formation whereby the user can apply an opening force to the lid, conveniently an upwardly extending lug, pull-tab or handle 32 by means of which the end user can grip the lid and pull upwardly relative to the bowl to start the tear of the lid material along the boundary region.

The boundary region can be a closed loop, so th
completely along the boundary permitting total
21 of the lid. However, in an alternative, the boundary 31 is not a continuous loop and part of the flange 23 is not rendered frangible, and so acts as a retaining tab securing the detached part of the lid to the remainder of the periphery of the lid which in turn is still secured to the periphery of the bowl.

It will be recognised that tearing the material of the lid along the line of the frangible region 31 does not damage the central portion 21 of the lid, and thus if desired the user can replace the lid after consuming, for example, part of the content of the container, the lid being retained in place in the bowl by the snap-engagement of the wall 22 of the lid against the wall 14 and shoulder 13 of the bowl. Thus the seal will be re-established at the interface of the lid and the bowl. However, as mentioned previously the snap-engagement of the wall 22 with the wall 14 is a relatively light engagement and so can be made and broken easily by the user when opening and closing the container.

Although in a preferred embodiment of the container the lid can be replaced to re-seal with the bowl it will nevertheless be recognised that once the frangible boundary line has been torn there will be clear visible evidence to anyone handling the container that the container has already been opened. Moreover the tearing of the material along the frangible boundary line when the container is first opened is accompanied by a distinctive sound and feel perceived by the person opening the container and the absence of the sound and/or tactile experience when opening a container where the frangible boundary line has already been ruptured. Thus the frangible line provides a

"tamper-evident" feature by means of which it
purchaser by appearance and/or sound and/or f
opened or otherwise been subjected to tampering prior to purchase. Desirably the container will be marked, by means of a label, or printing on the material of the container, to warn a potential purchaser not to complete the purchase, or not to consume the contents, in the event that the frangible boundary line has been broken. Moreover it would be possible to make the lid and bowl in different coloured materials so that tampering is even more evident visually.

The manner in which the frangible boundary region of the lid is formed will depend upon the nature of the material of the lid. There are a number of ways, dependent upon the nature of the material, in which the material of the flange 23, or another convenient region of the lid 12, can be rendered frangible. A convenient method however is perforation of the lid material to define the boundary region 31. Figures 10 and 11 illustrate a conventional perforation technique which can be used where the material of the lid 12 is relatively easy to tear.

In the method depicted in Figures 10 and 11 the material of the lid, prior to engagement of the lid with the bowl, is provided with a plurality of longitudinally spaced slots 33 which are punched, or cut into the material of the lid. The slots 33 form a line along the frangible boundary region and are spaced apart by tags 34 of the full thickness of the lid material. Provided that the dimensions of the tags are selected in accordance with the strength of the material then the lid will tear easily along the line of the slots 33 leaving half of the flange 23 and the peripheral wall 24 of the lid in place on the bowl 11. Materials which are suitable for treatment in this way are HIPS and OPS.

However, there are many attractions to making materials such as APET, PP and PVC but in relation to providing a frangible boundary region APET, PP and PVC have the serious difficulty of being extremely difficult to tear. Thus the technique illustrated in Figures 12, 13, 14, 15 and 16 has been devised for producing a frangible boundary region in lid materials of the APET type. As apparent from Figures 12 and 13 the lid material is cut along the line of the frangible boundary region to produce an elongate region of significantly reduced thickness within the material.

The region of significantly reduced thickness is perforated so that the material on opposite sides of the frangible boundary region is connected only by tags 36 of a thickness significantly less than the thickness of the material. The thickness of the tags 36, their spacing along the zone of reduced thickness 35, and the width of the tags 36 is selected in accordance with the strength of the lid material in order to ensure that the boundary region 31 is readily frangible by an end user of the container.

Figures 14, 15 and 16 illustrate a convenient apparatus for producing the frangible boundary region illustrated in Figures 12 and 13. Lid material, conveniently the flange 23, is supported from one side by an anvil 37. In Figure 14 the anvil 37 is shown curved, and of a width such that it can be received within the periphery of the lid beneath the flange 23 thereof. The operation is performed after thermoforming of the lid, and the anvil shown in Figure 14 is curved to match the curve of the flange 23, but for convenience the material is illustrated in the drawings as flat sheet. Thus it will be recognised that the positioning of the anvil relative to the lid is such that the

frangible boundary region being produced lies a flange 23.

The anvil 37 is of castellated form, the flat top surface 38 of the anvil having been cut away at a plurality of equiangularly spaced regions to provide recesses 39. The depth of the recesses 39 (indicated at X in Figure 14) is less than the thickness of the lid material by an amount equal to the desired thickness of the tags 36 along the finished frangible boundary region.

A curved, sharpened blade 41, the curvature of which matches the curvature of the anvil 37, is positioned with its sharp, planar (unbroken) cutting edge 42 parallel to the top surface 38 of the anvil. The blade 41 is driven downwardly in use to co-operate with the anvil 37, the cutting edge 42 of the blade 41 severing the lid material between the blade and the anvil. However, because the lid material is supported only at a plurality of equiangularly spaced points on the anvil, that is to say on the surface of the castellations separating the recesses 39, the lid material is severed completely only in the regions where the lid material is trapped between the blade and the top surface 38 of the anvil. Intermediate the castellations of the anvil the material is flexed downwardly, by the blade, into the recesses 39 and the lid material in the region of the recesses 39 is thus cut through to a depth equal to the difference between the thickness of the lid material and the depth of the recesses 39. When the blade 41 is lifted away from the anvil the material which was depressed into the recesses 39 restores to its previous planar configuration leaving a frangible boundary region cut as depicted in Figures 12 and 13 (it being understood that the boundary line 31 in Figures 12 and 13 is shown as a rectilinear region only for convenience). Figure 15 illustrates the deformation of the lid material into a recess 39.

It will be recognised that while the region 31 in parallel-sided channel the base of which is perforated, in practice using the blade of the kind illustrated in Figures 14, 15 and 16 the groove will be a V-shaped groove with the apex of the groove penetrating the lower surface of the lid material at a plurality of points spaced along the length of the groove. It will be recognised that the provision of a sharp edge on the blade 41 is crucial to satisfactory production of the frangible boundary region.

Figure 16 illustrates a modification to the blade 41 to minimise impact of the cutting edge 42 of the blade 41 on the top surface 38 of the anvil with the objective of increasing the useful life of the blade 41 before it needs to be re-sharpened. An abutment or stop member 43 is anchored to one face of the blade 41 and presents a lower abutment surface 44 to the anvil 37. The surface 44 of the member 43 is planar and is parallel to the top surface 38 of the anvil. The surface 44 of the member 43 is spaced above the level of the cutting edge 42 by an amount Y (Figure 16) and is parallel to the edge 42. The dimension Y is the thickness of the lid material to be cut, and thus when the blade 41 is moved towards the anvil 37 to sever the lid material interposed between the blade and the anvil, the surface 44 of the member 43 engages the upper surface of the lid material thus trapping the lid material between the surface 44 and the top surface 38 of the anvil just as the edge 42 of the blade passes through the thickness of the lid material. Thus the stop member 43 in conjunction with the thickness of the material being cut, prevents heavy impact of the blade edge 42 on the anvil 37 minimising the risk of the blade being blunted by impact with the anvil.

The method described above with reference to
with more easily torn materials such as HIPS a
depth and tag dimensions and spacing being selected to ensure that the lid is retained sufficiently securely for handling purposes.

It will be recognised that there are other ways in which a frangible boundary region could be provided in the lid material. For example the lid material could be provided with a groove which does not completely penetrate the thickness of the material. However, in APET type materials even a thin continuous membrane may be very difficult to tear. The provision of perforations completely through the lid material does not entail hygiene risks in a container configuration where the lid has a sealed interface with the bowl inwardly of the periphery of the container from the frangible boundary region, as is provided by the walls 14 and 22 of the bowl and the lid described above.

In all of the examples described above the frangible boundary region is provided in the flange 23 of the lid and this is the preferred arrangement as it renders tampering much more evident. However in some arrangements it would be possible to provide the boundary region elsewhere, for example in the flange 16 of the bowl, it being recognised that operatively the result would be similar to that described above except that the periphery of the lid and the attached periphery of the bowl would be detached with the lid when opening the container and tampering might not be as apparent as when the boundary region is provided in the lid.